

THE CONIFER CONNECTION

Appendix I CALIFORNIA STATE CONTENT STANDARDS and ENVIRONMENTAL PRINCIPLES AND CONCEPTS

California State Content Standards

Field trips and activities can help students achieve California State Content Standards in many content areas. Listed below, in abbreviated form, are some of the Content Standards from grades 4–7 that can be at least partially taught either through field trips to forests or through the activities in *The Conifer Connection*. For the complete standards, go to the California Department of Education’s Web site: <http://www.cde.ca.gov/be/st/ss>.

Doing the activities in *The Conifer Connection* will generally NOT teach a standard to mastery, but will help students achieve the standard.

California’s Environmental Principles and Concepts

Following the Content Standards, California’s Environmental Principles and Concepts (EP&C) are given. The EP&C examine the interactions and interdependence of human societies and natural systems. The nature of these interactions is summarized in the Environmental Principles and Concepts.

These Principles and Concepts (EP&C) are not intended to be an additional set of state standards. Rather, they provide a summary of important principles that can be taught in the subject matter areas. As teachers plan their science, history, mathematics, and English lessons, they might look for opportunities to incorporate those principles and concepts into their lessons. The EEI *Environmental Education Model Curriculum* Consists of 85 units that can be used to teach content standards along with the EP&C in science and social studies lessons in grades K–12. The Environmental Principles and Concepts are listed in Appendix I.

The Model Curriculum consists of 85 units for grades K–12. Each unit focuses on one curriculum standard in science or history-social science. Each provides several lessons that enable the teacher to teach that standard from an environmental perspective while also teaching one or more of the Environmental Principle and Concepts.

For information on the *Environmental Education Model Curriculum* or the Environmental Principles and Concepts, contact:

California Environmental Protection Agency
Office of Education and the Environment
P.O. Box 2815, Sacramento, CA 95812-2815

(916) 341-6769 or www.CaliforniaEEI.org

National Standards

National content standards are not as specific as state content standards, but may be useful for users of *The Conifer Connection* in states other than California. National content standards in science and social studies follow the California standards and environmental principles and concepts on next page.

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CALIFORNIA CURRICULUM CONTENT STANDARDS ADDRESSED IN *THE CONIFER CONNECTION*

To save space, the Content Standards on the following pages are listed in abbreviated, paraphrased form.

Grade Four Science Content Standards

Life Sciences Standard Set 2

(All organisms need energy and matter to live and grow.)

- 2.a Plants...primary source of matter and energy...food chains
- 2.b Producers and consumers (herbivores, carnivores, omnivores, decomposers)
- 2.c Decomposers recycle matter.

Life Sciences Standard Set 3

(Living organisms depend on one another and their environment.)

- 3.a Ecosystems are characterized by living and non-living components.
- 3.b In any environment, some survive well, some less well, and some don't survive.
- 3.c Animals depend on plants for food and shelter.
- 3.d Most microorganisms do not cause disease and many are beneficial.

Investigation and Experimentation Standard Set 6

(Students ask meaningful questions and conduct careful investigations.)

- 6.a Observations and inferences
- 6.b Measure and estimate
- 6.c Formulate predictions...cause and effect relationships
- 6.d Conduct multiple trials and draw conclusions
- 6.e Construct and interpret graphs from measurements
- 6.f Follow written instructions for a scientific investigation

Grade Four History-Social Science Content Standards

Standard Set 4.1

(Physical and human geographic features define places and regions.)

- 4.1.3 Describe how physical environment affects human activity
- 4.1.4 Explain affects of Pacific Ocean, rivers, valleys...on growth of towns

Standard Set 4.2

(Describe...life...of people of California from pre-Columbian societies...)

- 4.2.1 Discuss how California Indians depended on, adapted to, and modified the environment
- 4.2.5 Describe the daily lives of the people, native and nonnative...

Standard Set 4.3

(Explain the economic, social, and political life...through the Gold Rush...)

- 4.3.1 Identify the locations of settlements...including Fort Ross
- 4.3.3 Analyze effects of the Gold Rush on...the physical environment

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Standard Set 4.4

(Trace transformation of ...California economy...)

- 4.4.2 Explain how the Gold Rush transformed the economy...including products produced and consumed
- 4.4.5 Discuss the effects of the Great Depression, Dust Bowl, and World War II

Grade Four English-Language Arts Content Standards

Reading Standard Set

- 1.3 Use knowledge of root words to determine meanings
- 1.4 Analyze complex words with Latin and Greek roots

Writing Standard Set

- 2.3 Write information reports

Written and Oral English Language Conventions Standard Set

- 2.2.4 Recite brief poems

Listening and Speaking Standard Set

- 1.0 Listening and speaking strategies
- 2.0 Speaking applications

Grade Four Mathematics Content Standards

Number Sense Standard Set

- 3.0 Solve problems involving addition, subtraction, multiplication, and division

Measurement and Geometry Standard Set

- 1.0 Understanding perimeter and area

Statistics, Data Analysis, and Probability Standard Set

- 1.0 Organize, represent, and interpret numerical data

Grade Five Science Content Standards

Life Sciences Standard Set 2

(Plants and animals have structures for various life processes.)

- 2.a Specialized structures to support the transportation of materials
- 2.e Sugar, water, and minerals transported in a vascular plant
- 2.f Plants use CO₂ and energy from sunlight to build molecules and release oxygen
- 2.g Cells break down sugar to obtain energy, releasing CO₂ and water (cellular respiration)

Earth Sciences Standard Set 3

(Water moves between oceans and land via evaporation and condensation.)

- 3.b Water evaporates to form water vapor, can form liquid or ice
- 3.c Water vapor moves and can form fog, dew, rain, hail, sleet, or snow
- 3.d Fresh water is limited
- 3.e Students know the source of the water used in their communities

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Earth Sciences Standard Set 4

(Energy from the sun heats Earth unevenly, resulting in changing weather.)

- 4.b Influence of ocean on weather

Investigation and Experimentation Standard Set 6

(Students ask meaningful questions and conduct careful investigations.)

- 6.a Classify objects
- 6.b Develop a testable question
- 6.c Plan and conduct simple investigation
- 6.d Use of variables
- 6.f Selection and use of appropriate tools
- 6.g Make and interpret graphic representations of data
- 6.h Draw conclusions from evidence
- 6.i Write a report...

Grade Five History-Social Science Content Standards

Standard Set 5.1

(Describe major pre-Columbian settlements, including American Indians of the Pacific Northwest.)

- 5.1.1 Describe how geography and climate influenced ...various nations

Standard Set 5.8

(Trace colonization...and settlement patterns...with emphasis on ...economic incentives, effects of the physical...geography)

- 5.8.2 Major geographical features of California

Grade Five English-Language Arts Content Standards

Reading Standard Set

- 1.2 Use word origins to determine the meaning of unknown words
- 1.4 Know...derived roots...from Greek and Latin.

Writing Standard Set

- 2.3 Write research reports

Listening and Speaking Standard Set

- 1.1 Ask questions that seek information
- 1.2 Interpret a speaker's verbal and nonverbal messages, purposes, and perspectives
- 1.3 Make inferences or draw conclusions based on an oral report

Listening and Speaking Standard Set

- 1.0 Listening and speaking strategies
- 2.0 Speaking applications

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Grade Five Mathematics Content Standards

Number Sense Standard Set

- 1.0 Computation, rounding, percents, decimals, fractions
- 2.0 Calculating and solving problems, including fractions and decimals

Measurement and Geometry Standard Set

- 1.0 Computing volumes and areas

Statistics, Data Analysis, and Probability Standard Set

- 1.0 Display, analyze, compare, and interpret data sets, including graphing

Grade Six Science Content Standards

Earth Science Standard Set 2

(Topography is reshaped by weathering and transportation of sediment.)

- 2.a Water running downhill shapes landscape
- 2.b Rivers and streams erode soil, transport sediment, change contour, and flood in natural and recurring patterns
- 2.d Landslides and floods change human and wildlife habitats

Ecology (Life Sciences) Standard Set 5

(Organisms exchange energy and nutrients among themselves and with the environment.)

- 5.a Energy enters ecosystems as sunlight...food webs
- 5.b Matter transferred between organisms and physical environment in food webs
- 5.c Populations can be categorized by the functions they serve in an ecosystem
- 5.d Different kinds of organisms may play similar ecological roles in similar biomes
- 5.e Numbers and types of organisms in an ecosystem depend on abiotic factors

Investigation and Experimentation Standard Set 7

(Students ask meaningful questions and conduct careful investigations.)

- 7.a Develop a hypothesis
- 7.b Select and use tools to perform tests
- 7.c Construct graphs
- 7.d Communicate in written and oral presentations
- 7.e Recognize whether evidence is consistent with a proposed explanation
- 7.f Read topographic and geologic maps
- 7.g Interpret events by sequence and time
- 7.h Identify changes in natural phenomena over time

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Grade Six Social Studies Content Standards

Standard Set 6.1

(Describe what is known through archaeological studies...)

- 6.1.1 Describe the hunter-gatherer societies
- 6.1.2 Identify locations of communities and how humans adapted
- 6.1.3 Discuss...human modifications of the physical environment

Grade Six English-Language Arts Content Standards

Writing Standard Set

- 1.4 Use electronic text to locate information
- 1.5 Compose documents...using word processing skills
- 2.3 Write research reports

Listening and Speaking Standard Set

- 1.0 Listening and speaking strategies
- 2.0 Speaking applications

Grade Six Mathematics Content Standards

Number Sense Standard Set

- 1.0 Solving problems using fractions, ratios, proportions, and percentages
- 2.0 Calculate and solve problems

Measurement and Geometry Standard Set

- 1.0 Measurement of plane and solid shapes, including the use of pi

Statistics, Data Analysis, and Probability Standard Set

- 2.0 Use data samples...including bias and validity

Grade Seven Science Content Standards

Life Science...Evolution Standard Set 3

(Biological evolution accounts for diversity.)

- 3.1 Both genetic variation and environmental factors cause evolution and diversity
- 3.4 Classification
- 3.5 Extinction from environmental changes

Life Science...Structure and Function in Living Systems Standard Set 5

(Anatomy and physiology)

- 5.b Organisms depend on properly functioning organs and organ systems
- 5.f Reproductive structures and processes in flowering plants

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Investigation and Experimentation Standard Set 7

(Students ask meaningful questions and conduct careful investigations.)

- 7.a Use tools to perform tests, collect data, and display data
- 7.b Use variety of resources, including World Wide Web, to collect data
- 7.c Communicate connections among hypotheses, concepts, tests, data, and conclusions
- 7.d Construct scale models, maps, and diagrams to communicate knowledge
- 7.e Communicate steps and results of investigation in written and oral presentations

Grade Seven English-Language Arts Content Standards

Reading Standard Set

- 1.2 Use knowledge of Greek, Latin, and Anglo-Saxon roots and affixes

Writing Standard Set

- 1.4 Research and Technology...questioning, developing ideas
- 1.5 Citing sources
- 1.6 Creating documents using word-processing skills
- 1.7 Revising
- 2.3 Write research reports

English Listening and Speaking Standard Set

- 1.0 Listening and speaking strategies
- 2.0 Speaking applications

Grade Seven Mathematics Content Standards

Number Sense Standard Set

- 1.0 Properties of rational numbers, including calculating percentages

Mathematical Reasoning Standard Set

- 2.0 Using estimation

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CALIFORNIA'S ENVIRONMENTAL PRINCIPLES AND CONCEPTS

Principle I

The continuation and health of individual human lives and of human communities and societies depend on the health of the natural systems that provide essential goods and ecosystem services. As a basis for understanding this principle:

- Concept a.** Students need to know that the goods produced by natural systems are essential to human life and the functioning of our economies and cultures.
- Concept b.** Students need to know that the ecosystem services provided by natural systems are essential to human life and to the functioning of our economies and cultures.
- Concept c.** Students need to know that the quality, quantity and reliability of the goods and ecosystem services provided by natural systems are directly affected by the health of those systems.

Principle II

The long-term functioning and health of terrestrial, freshwater, coastal and marine ecosystems are influenced by their relationships with human societies. As a basis for understanding this principle:

- Concept a.** Students need to know that direct and indirect changes to natural systems due to the growth of human populations and their consumption rates influence the geographic extent, composition, biological diversity, and viability of natural systems.
- Concept b.** Students need to know that methods used to extract, harvest, transport and consume natural resources influence the geographic extent, composition, biological diversity, and viability of natural systems.
- Concept c.** Students need to know that the expansion and operation of human communities influences the geographic extent, composition, biological diversity, and viability of natural systems.
- Concept d.** Students need to know that the legal, economic and political systems that govern the use and management of natural systems directly influence the geographic extent, composition, biological diversity, and viability of natural systems.

Principle III

Natural systems proceed through cycles that humans depend upon, benefit from and can alter. As a basis for understanding this principle:

- Concept a.** Students need to know that natural systems proceed through cycles and processes that are required for their functioning.
- Concept b.** Students need to know that human practices depend upon and benefit from the cycles and processes that operate within natural systems.
- Concept c.** Students need to know that human practices can alter the cycles and processes that operate within natural systems.

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Principle IV

The exchange of matter between natural systems and human societies affects the long-term functioning of both. As a basis for understanding this principle:

- Concept a.** Students need to know that the effects of human activities on natural systems are directly related to the quantities of resources consumed and to the quantity and characteristics of the resulting byproducts.
- Concept b.** Students need to know that the byproducts of human activity are not readily prevented from entering natural systems and may be beneficial, neutral, or detrimental in their effect.
- Concept c.** Students need to know that the capacity of natural systems to adjust to human-caused alterations depends on the nature of the system as well as the scope, scale, and duration of the activity and the nature of the byproducts.

Principle V

Decisions affecting resources and natural systems are based on a wide range of considerations and decision-making processes. As a basis for understanding this principle:

- Concept a.** Students need to know the spectrum of what is considered in making decisions about resources and natural systems and how those factors influence decisions.
- Concept b.** Students need to know the process of making decisions about resources and natural systems, and how the assessment of social, economic, political, and environmental factors has changed over time.

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NATIONAL SCIENCE EDUCATION CONTENT STANDARDS Grades 5–8

(Paraphrased from *National Science Education Standards*, published by the National Academy of Sciences, 1996)

...all students should develop:

- A. ...abilities necessary to do scientific inquiry and understandings about scientific inquiry
- B. ...an understanding of properties and changes of properties in matter; motions and forces; transfer of energy (Physical Science)
- C. ...an understanding of structure and function in living systems; reproduction and heredity; regulation and behavior; populations and ecosystems; diversity and adaptations of organisms (Life Science)
- D. ...an understanding of structure of the earth system; Earth's history; Earth in the solar system (Earth and Space Science)
- E. ...abilities of technological design; understandings about science and technology (Science and Technology)
- F. ...understanding of personal health, populations, resources, and environments; natural hazards; risks and benefits; science and technology in society (Science in Personal and Social Perspectives)
- G. ...understanding of science as a human endeavor; the nature of science; the history of science (History and Nature of Science)

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NATIONAL SOCIAL STUDIES CURRICULUM STANDARDS Middle Grades

(paraphrased from *Curriculum Standards for Social Studies: Expectations of Excellence*, published by the National Council for the Social Studies, 1994)

I. Culture

- d. understand that different individuals and groups have different values

II. Time, Continuity and Change

- e. develop understandings about attitudes, values, and behaviors of people in different historical contexts
- f. use historical concepts and inquiry to inform decision-making and action-taking on public issues

III. People, Places and Environments

- c. use maps, graphs, data bases
- e. understand landforms such as mountains and ecosystems
- f. describe physical system changes such as the water cycle
- g. describe how people affect their environment
- h. understand land use choices and ecosystem changes
- i. understand social and economic effects of environmental events
- k. understand various land and resource use options

IV. Individual Development and Identity

- b. describe personal connections to place
- h. work independently and cooperatively to accomplish goals

V. Individuals, Groups and Institutions

- e. understand tensions between belief systems and government policies and laws
- g. understand how groups and institutions work to meet individual needs and promote the common good

VIII. Science, Technology and Society

- b. understand how science and technology have affected people's perceptions of the social and natural world

X. Civic Ideals and Practices

- c. understand multiple points of view about public issues
- d. practice discussion and participation consistent with a democratic republic

Appendix II GLOSSARY

Abiotic Factor: non-living factor or part of an environment such as air, water, soil, or sunlight.

Adaptation: a characteristic such as a body part or behavior that helps a organism survive.

Alluvial Flat: a place where sand, gravel, and silt have been deposited by moving water to form a flat area.

Alluvial Floodplain: See alluvial flat.

Angiosperm: a flowering plant; one that bears seeds in a layer of tissue (fruit) that protects the seed and provides nutrients. (See gymnosperm.)

Aquifer: an underground area such as a buried river bed where there is porous rock that contains water.

Back Cut: the second cut made when felling a tree; the cut that actually causes the tree to fall. (See undercut.)

Biodiversity (biological diversity): the variety of organisms in an ecosystem.

Biological Integrity: a biological system's wholeness or completeness, including not only the variety of species (biodiversity), but also the functioning of biological processes.

Biomass: the total mass (weight) of living matter in a place.

Biotic Factor: living factor or part of an environment such as plants, animals, and bacteria.

Blowdown: trees or other plants blown over by wind.

Bole: main stem or trunk of a tree, especially the portion that is large enough to be used for lumber.

Buck: to cut up a log or bole into pieces of a desired length.

Cable Yarder: machine that uses steel cables to move logs, usually to the area (yard) where they are loaded onto trucks for movement to the mill.

Cabling: using cables to move logs in the timber harvesting process.

Cambium: a thin layer of cells just inside/under the bark of a tree. (The cambium produces the xylem and phloem cells that conduct materials up and down and form the wood of a tree.)

Canopy: a forest layer or cover formed by the branches and leaves of trees.

Carbon Dioxide (CO₂): chemical used by plants in photosynthesis and produced by plant and animal cells during the process of cellular respiration.

Carnivore: an animal that primarily eats meat.

Carrying Capacity: the maximum number of individuals of a species that can survive and reproduce (live) in a particular place or ecosystem on a long-term basis.

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Catchment Basin: watershed; area drained by streams.

Clear-cut: a method of harvesting trees in which all (or nearly all) of the trees in a given area are cut in one operation. (See also selective logging.)

Climax Community: a relatively stable, long-lasting community of plants and animals achieved after the plants and animals in a place have gone through a series of succession stages.

Cloning: to produce new individuals from a single individual by cuttings, fission or some other asexual method.

Cohesion: sticking together of molecules of the same type, as water molecules tend to be attracted to each other and stick together.

Community: all of the organisms in a particular habitat or ecosystem.

Conifer (coniferous): a tree such as a redwood, pine, fir, or spruce that reproduces through the production of cones (as opposed to flowers and fruits).

Controlled Burn: intentional burning of an area, usually to remove brush, slash, or unwanted species of plants—syn. prescribed burn.

Conservation: the wise use of resources to provide the most good for the most people

Consumer: an organism that obtains the energy and materials that it needs from other organisms. (See producer.)

Cross-cut Saw: a saw made to cut across the grain, as one used to fell a tree.

Crustose (lichen): a form of lichen that grows close to the surface of the substrate, usually rock or bark, crust-like.

Cycle: a repeating process such as the water cycle, nitrogen cycle, or a life cycle.

Damping Off (from fungus): death of seeds or seedlings due to fungus.

DBH (diameter at breast height): diameter of a tree measured 4.5' above ground on the uphill side.

Deciduous: a plant that loses its leaves, especially in the winter, or in the dry season. (See evergreen.)

Decompose: to break down chemically; to rot.

Decomposer: an organism that obtains nutrients and energy by breaking down dead organisms mechanically or chemically; primarily fungi and bacteria.

Decomposition: the act of decomposing.

Detritivore: an organism that eats dead organisms; a scavenger.

Drag Saw: a type of gas powered saw used to cut down trees in the 1930s and 1940s.

Duff: partially decayed organic matter on the forest floor.

Ecology: the study of the interactions of living things and their environment.

Ecosystem: organisms and their environment.

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Ecotone: the area where two different ecosystem types meet

Endemic: native to a particular place, naturally occurring; sometimes used to indicate that the organism is restricted to a particular area.

Evergreen: a tree that doesn't lose its leaves in the winter. (See deciduous.)

Environmentalism: caring about the environment and taking action to protect or conserve it; the meaning of "protect or conserve" is different for different people.

Epiphyte: a plant that grows on another plant.

Exotic Species: a species that has been introduced into a non-native environment.

Fall(ing): to cut a tree down.

Fell(ing): to cut a tree down.

Flume: an artificial channel or trough, usually above ground, that carries water to a place where it is used, or uses water to carry logs or other items.

Foliose (lichen): a form of lichen that grows in a leafy/flakey form.

Food Chain: the transfer of energy and materials (food) from one organism to another in a series of steps; a food chain is a portion of a food web.

Food Pyramid: See pyramid of numbers.

Food Web: the transfer of energy and materials (food) among the organisms in a community; a food web is more complex but more realistic than a food chain.

Fragmentation: the breaking up of something, such as a tract of forest, into smaller pieces or parcels.

Fruticose (lichen): a form of lichen that grows in a stringy, moss-like mass.

Geotropism: growth in response to the Earth's gravity. (Positive geotropism is growth towards the earth; negative is growth away from the earth. Thus, roots exhibit positive geotropism while stems exhibit negative geotropism.)

Global Climate Change: changes in the Earth's climate, possibly due to human actions. (Global warming is part of global climate change, but climate change includes other things such as changes in severe weather patterns and cooling in some areas.)

Global Warming: an increase in the average temperature of the Earth's atmosphere. Certain chemicals, called greenhouse gasses, tend to increase global warming by trapping heat energy that would otherwise be radiated out into space. An example of a greenhouse gas is carbon dioxide. (See Global Climate Change.)

Greenhouse Effect: See global warming.

Greenhouse Gas: a gas, such as carbon dioxide, that tends to trap heat energy. (See global warming.)

Gulch(ing): former logging practice of dragging logs downhill to a landing where they could be loaded onto rail cars or transported by water to a mill.

Gymnosperm: a plant that bears its seeds in a cone, without a fleshy protective covering. (See angiosperm.)

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Habitat: an area where an animal or plant lives.

Hardwood: a deciduous or broad leaf tree, such as an oak or madrone, or the wood from such a tree. (The wood isn't necessarily any harder than the wood of a softwood such as pine, fir, or redwood.)

Heartwood: the no-longer-living center part of a tree stem (It is generally darker and harder than the outer sapwood. The heartwood provides support for the tree.)

Hemiparasite: an organism that derives some of its nourishment by parasitism and some as a free-living organism; a facultative parasite. Mistletoe is an example.

Herbaceous: a plant with a soft stem, as opposed to a woody stem.

Herbivore: an animal that eats mostly plants.

High-lead Cabling: See skyline cabling.

Humus: decomposed or decomposing material in the top section of the soil.

Hydraulic Mining: using water to separate gold from sand or gravel, or to remove the sand and gravel from a hillside.

Introduced Species: an exotic species; one that has been brought to a habitat that is not its natural habitat.

Invasive Species: a type of plant or animal that is introduced into a habitat and tends to take over, out-competing native species.

Landing: site where logs are stored until loaded onto trucks, train cars, or otherwise moved to the mill.

Law of Conservation of Matter: the scientific "law" stating that matter or mass can neither be created nor destroyed.

Legacy Issues: Problems that stem from previous human actions, such as erosion from old, poorly designed logging roads.

Lichen: an organism formed by a fungus and a photosynthetic organism such as an alga.

Life Zone: a belt or area on a mountain side with physical characteristics (primarily temperature and water) that support a particular plant/animal community.

Limiting Factor: whatever retards or causes a population's growth to stop. It may be too much of something like shade, heat, predators, or disease, or it may be too little of something like food, sunlight, water, or soil nutrients.

Litter: fallen leaves and small branches on the forest floor.

Macroinvertebrate: an invertebrate animal (animal without a backbone) that is large enough to be seen without a microscope; often used to refer to aquatic organisms such as insects and other arthropods.

Management: choosing what happens to an ecosystem, with specific goals in mind.

Microhabitat: a small habitat, or a habitat within a habitat. Examples include a rotting log, or the ground under the rotting log, or the bark of a tree, or the forest canopy.

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Microorganism: an organism that is too small to see without the use of a microscope.

Milling: cutting logs into boards.

Misery Whip: See whipsaw.

Monoculture: growing of one plant species in an area for several growth cycles

Mutualism: a relationship between two organisms in which both benefit.

Naiaid: immature form of certain aquatic insects such as dragonflies and damselflies.

Natural Pruning: the dying and breaking off a tree's lower branches.

Niche: the ecological role of an organism.

Old-growth: a forest or stand of trees with characteristics of forests before the coming of Europeans. See Section I, Chapter 2 for a discussion of old-growth and related terms. Old-growth forests and stands of trees include trees of varying ages.

Omnivore: an organism that feeds on both plants and animals

Open System: ecological system in which energy and matter enters and leaves.

Overpopulation: a condition in which an organism's population has exceeded the carrying capacity of its environment.

Overstory: See canopy.

Parasite (parasitic): an organism that lives in or on another organism, feeding on it.

Phloem: plant tissue that transports nutrients from the leaves or needles to other parts of the plant; found between the bark and the cambium.

Photosynthesis: process by which plants and algae use water, carbon dioxide, and light energy to form sugars and oxygen, storing energy in the sugars or starches for eventual use in cellular respiration.

Phototropism: plant growth response to light. A positive phototropism is growth towards the light, as exhibited by leaves and branches; a negative phototropism is growth away from the light, as exhibited by roots, which exhibit positive geotropism.

Pioneer Species: the first species of plants to start growing on bare rock or bare ground.

Plant Belt: strip along a mountain range where similar plant/animal communities are found, primarily due to similar temperatures and water availability.

Population: the number of a particular type of organism in a particular place at a particular time, or the organisms themselves.

Prescribed Burn: fire set intentionally for a specific reason such as to reduce the amount of fuel or to remove undesired types of plants—synonym: controlled burn.

Preservation: managing the land so that it remains, as much as possible, in a more or less natural state.

Producer: an organism that builds complex chemicals from simple chemicals, usually through photosynthesis; usually plants or algae.

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Protista: kingdom of organisms with true cells but that aren't plants, animals, or fungi, includes the algae and some animal-like protists called "protozoans."

Pyramid of Numbers: a diagram showing the numbers of different kinds of organisms at different trophic levels. It is pyramid shaped because an ecosystem will support many more plants (first trophic level organisms) than top carnivores. Also called food pyramid.

Rain Shadow Effect: condition in which most precipitation falls on one side of a mountain (range) because approaching moist air is forced to rise, and therefore cool, as it encounters the mountain. The dry areas to the east of the Sierra Nevada fall in the rain shadow of the Sierra Nevada.

Redd: area where a fish such as a salmon or trout lays its eggs (spawns).

Release: rapid growth in diameter and height, usually exhibited after the canopy opens in a stand of trees resulting in more sunlight, nutrients, and water being available to stimulate the growth of the remaining trees; opposite of suppression.

Respiration (Cellular Respiration): chemical process in which a cell uses sugar or starch and oxygen to release energy, producing carbon dioxide and water as byproducts. (Not to be confused with the physical act of breathing.)

Riparian: stream-side.

Root Hair: tiny projection from the outer layers of roots, site of most water and nutrient absorption in most plants.

Salmonid: a member of the salmon and trout family of fish.

Sapwood: wood that carries water and nutrients for the tree. The sapwood is generally lighter in color than the heartwood, and includes xylem and phloem.

Scavenger: an animal that primarily eats dead organisms; a detritivore.

Schooner: a type of sailing ship with two or more masts.

Second Growth: trees that grow after an area's first logging.

Seed: plant embryo, encased in a protective covering and surrounded by a food supply.

Selective Logging (harvesting): logging by removing only a portion of the trees in a stand, as opposed to clear-cut logging.

Sere: the series of communities in a successional sequence.

Skid Trail: path formed by or for moving logs to a landing

Skyline (Sky-lead) Cabling: the use of cables to move logs by suspending them from spar trees or other devices so that one or both ends of the log are off the ground.

Slash: branches, tree tops, broken trees, brush, and other plant "waste" from a logging operation.

Slump Jumble: an area where a hillside has slid downhill, forming a "jumble" of disturbed soil and plants.

Snag: large dead tree; provides habitat for various species such as birds and bats.

Softwood: cone-bearing tree or the wood thereof; not necessarily any softer than "hardwood."

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Sorus (sori): cluster of sporangia on the underside of a fern frond.

Spar Tree: tree to which cables are attached for moving logs to a landing.

Spawn: the act of producing or depositing eggs, especially by fish.

Species: a group of similar organisms that can breed and produce fertile offspring.

Sporangium (sporangia): structure in ferns that contains the spores.

Spore: an asexual reproductive body of certain organisms such as fungi, algae, or bacteria.

Springboard: a board once used by loggers to stand on while cutting a tree several feet above the ground.

Stand: a group of plants, especially trees.

Stewardship: caring for the land or environment.

Stomate or Stoma (stomata): opening in the underside of a leaf. The stomata allow movement of gases such as oxygen, carbon dioxide, and water to move in and out.

Subcanopy: a region of branches and leaves forming a distinct layer below the canopy.

Succession: a series of different organisms dominating a community in a particular place over a long period of time.

Suppression: a slowing down in growth, usually caused by shading produced as a stand's canopy grows together, shutting out the sunlight; opposite of release.

Surface Tension: the tendency of molecules, especially water molecules, to stick to each other at the surface of the liquid.

Sustained Yield: a method of forest management in which, over a period of time, the amount of wood harvested is equal to or less than the amount that grows.

Swamp(ing): moving logs to a landing, especially in the 1800s.

Tannin: a type of acidic chemical found in the wood and bark of trees such as redwood, oak, and tanoak. Tannins give wood a red or brown color and provide resistance to rot and insects.

Tap Root: in some plant species, the main central root that grows downward and usually has lateral roots growing outward from it.

Taxonomy: the science of classifying organisms based on their evolutionary relationships.

Third Growth: trees that grow after the harvest of second-growth trees.

Timber Harvest Plan (THP): a multi-faceted plan submitted to a governing agency such as the California Department of Forestry and Fire Protection prior to harvesting trees. A THP provides information describing how the harvest will be conducted, with the intention of maintaining wood supply while reducing environmental and social problems that might be caused by the harvest.

Tracked (vehicle): a type of vehicle equipped on each side with a continuous roller belt over cogged wheels; especially useful in muddy or steep terrain.

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Transpiration: the loss of water through a plant's leaves.

Treefall: one or more trees falling for any of a variety of reasons such as wind, undercutting of a river bank, death of roots, or other reasons.

Trophic Level: the step in a food chain or food web at which an organism functions.

Tropism: a growth response of a plant to an environmental condition such as light or gravity. A positive tropism is growth towards, while a negative tropism is growth away from the environmental condition.

Undercut: the first of two cuts made when falling a tree. The undercut determines the direction in which the tree will fall. (See back cut.)

Understory: trees that grow below the canopy or subcanopy layers in a forest.

Urbanized: having characteristics of an urban or city environment.

Vascular System: cellular system that enables an organism to move fluids throughout itself. In mammals, the vascular system includes the heart and blood vessels. In plants, the vascular system consists of the xylem and phloem tissues and the vascular cambium, which produces the xylem and phloem.

Vascular Tissue: tissues such as the xylem and phloem which are responsible for moving fluid throughout an organism. (See vascular system.)

Waterbar: a structure such as a ridge of soil and gravel built into a road or skid trail with the intention of diverting water to the side to reduce erosion.

Water Cycle: pattern of water movement, including evaporation, condensation, precipitation, transpiration, runoff, percolation, and other processes.

Watershed: the land area drained by a stream and its tributaries as they bring water and sediments to rivers or the ocean.

Whipsaw: a long cross-cut saw once used to buck or cut logs into shorter lengths or for felling a large tree. See misery whip.

Wildlife Region: similar to life zone, but with focus on animals rather than plants.

Windthrow (windfall): the knocking over of trees by the wind.

Xylem: plant tissue that carries water and minerals upward to the leaves of a plant; found inside of the cambium; primary component of wood.

Yard(ing): bringing logs to a landing area called a yard, where they are stored until they are loaded onto a truck, train, or in some other way conveyed to the sawmill.

Young Growth: trees that have regrown after an area has been logged, burned, or has had trees otherwise removed.

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Appendix III ORGANIZATIONS AND AGENCIES

Contacts

Many state parks have “cooperating associations” that help the parks, including interpretive programs. They may also have opportunities for students and families to become involved in service projects. If you go to the individual park’s Web site, you should be able to find the contact for the cooperating association.

Go to: www.parks.ca.gov

Some timber resource companies and sawmills will provide tours of their facilities. Check the yellow pages in the area where you will visit.

Some users of forest products might provide tours or guest speakers. Check the yellow pages for lumber yards, cabinet, furniture, and door manufacturers, and artists.

Fish hatcheries often provide tours.

Caution



The Web addresses listed in The Conifer Connection were accurate at the time of publication, but they often change. If an address doesn't work, perform an Internet search for the organization

Organizations with a Focus on Aquatic Habitat Education	
Adopt-A-Creek	www.valleywater.org
Adopt-A-Stream	www.adopt-a-stream.org
Adopt-A-Watershed	www.adopt-a-watershed.org
California Classroom Aquarium Education Project (C.A.E.P.) (a.k.a. Salmonids in the Classroom, Trout in the Classroom, Salmonid Project)	www.dfg.ca.gov/oceo/caep
California Coastal Commission	www.coastforyou.org
Global Rivers Environmental Education Network	www.igc.apc.org/green
Measuring the Health of California Streams and Rivers	www.slsii.org
Project WET	www.projectwet.org
Project WILD® Aquatic	www.dfg.ca.gov/projectwild
Save Our Streams (Isaac Walton League)	www.iwla.org/sos
Streamkeeper's Guide (Adopt-A-Stream Foundation)	www.streamkeeper.org
Watershed Restoration (CA Dept of Water Resources)	www.watershedrestoration/educationalmaterials

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Forest Products Industry Websites	
American Forest & Paper Association	www.afandpa.org
American Forests	www.amfor.org
California Forestry Association	www.foresthealth.org
California Licensed Foresters Association	www.clfa.org
California Redwood Association	www.calredwood.org
Forest Products Society	www.forestprod.org
Forest Foundation	www.calforestfoundation.org
Forestworld	www.forestworld.org
Steve Shook's Directory of Forest Products, Wood Science, and Marketing	www.forestdirectory.com
Western Wood Products Association	www.wwpa.org

The following have training and/or curriculum and other materials for teachers		
Cal Alive	CD-based curriculum	www.calalive.org
California Foundation for Agriculture in the Classroom	Curriculum on all types of agriculture	www.dfaitc.org
Food, Land, and People	Resources for learning	www.foodlandpeople.org
Forest Foundation	Free materials	www.calforestfoundation.org
Incense Cedar Institute	Information and kit on how pencils are made	www.pencils.com
International Paper	Posters, teacher's guides, booklet	www.internationalpaper.com
National Park Service	Curriculum	www.nps.gov
Project Learning Tree	Environmental Ed curriculum	www.plt.org
Project WILD	Wildlife curriculum	www.dfg.ca.gov/projectwild
Society of American Foresters	Forestry Institute for Teachers (see below)	www.forestryinstitute.org
Talk About Trees	Classroom talks	www.talkabouttrees.org
Temperate Forest Foundation	Videos and some materials for sale	www.forestinfo.org
Woodlinks	Forest careers kit	www.woodlinks.com

The Forestry Institute for Teachers (F.I.T.) is a week-long training opportunity offered to teachers at various locations around the state. Participants learn about forest ecosystems and resource management. Field trips to various related sites,

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presentations by experts in the field, and working with fellow teachers make F.I.T. a great learning experience. Participants receive training and resources from Project Learning Tree, Project WILD, and numerous other resources. F.I.T. is not only free, but teachers who submit curriculum materials afterwards also receive a stipend! For information, go to: www.forestryinstitute.org

The following organizations may also be of interest	
American Forest Foundation	www.affoundation.org
American Forests/Global ReLeaf	www.americanforests.org
Assoc. for Environmental and Outdoor Education	www.aeoe.org
California Community Forests Foundation	www.caltrees.org
Coastal Watershed Council	www.coastal-watershed.org
Conservation Foundation	www.theconservationfoundation.org
Council for Environmental Education	www.councilforee.org
CA Regional Environmental Community Network	www.creec.org
Defenders of Wildlife	www.defenders.org
Ecology Action	www.ecoact.org
Environmental Education Network	www.eelink.net
Environmental Protection Information Center (EPIC)	www.wildcalifornia.org
Forestry Protection Portal	www.forests.org
Friends of the Earth	www.foe.org
Izaak Walton League	www.iwla.org
National Arbor Day Foundation	www.arborday.org
National Audubon Society	www.audubon.org
National Wildlife Federation	www.nwf.org
Natural Resources Defense Council	www.nrdc.org
North American Assoc. for Environmental Education	www.naaee.org
Planning and Conservation League	www.pcl.org
Sierra Club	www.sierraclub.org
Save-the-Redwoods League	www.savetheredwoods.org
Student Conservation Association	www.thesca.org
The Nature Conservancy	www.nature.org
The Wilderness Society	www.wilderness.org
Trees Foundation	www.treesfoundation.org
Wildlands Restoration Team	www.wildwork.org
World Forestry Center	www.worldforestry.org

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California Governmental Agencies	
California Coastal Commission	www.coastforyou.org
California Department of Conservation	www.conservation.ca.gov
California Department of Education	www.cde.ca.gov
California Department of Fish and Game	www.dfg.ca.gov
California Department of Forestry and Fire Protection	www.fire.ca.gov
CA Dept. of Parks and Recreation (CA State Parks)	www.parks.ca.gov
California Department of Water Resources	www.water.ca.gov

U.S. Governmental Agencies	
National Park Service	www.nps.gov
U.S. Environmental Protection Agency (Region 9)	www.epa.gov/region9
U.S. Fish and Wildlife Service	www.fws.gov
U.S. Department of Agriculture, Forest Service: Pacific Southwest Region (Region 5)	www.fs.fed.us/r5

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Appendix IV RESOURCES AND SOURCES

Books

- Many parks have visitor centers where books and other resources can be purchased. Be sure to check them out when you do your pre-trip visit.
- Towns in the forested region often have book stores with a good selection of natural history books.
- You might want to join with other teachers or even other schools to create a library of science resource materials.
- Public libraries often appreciate requests from teachers so that they can spend their limited budgets on books that will be used.

There are many wonderful books that are useful in learning about California's coniferous forests. Listed below are some of those that I think would provide a great foundation for a forest education library. To save space, I have listed just the author and title here.

Caution



The Web addresses listed in The Conifer Connection were accurate at the time of publication, but they often change. If an address doesn't work, perform an Internet search for the organization

Top 10

Barbour, Michael et al.: *Coast Redwood: A Natural and Cultural History*

Duane, Timothy: *Shaping the Sierra: Nature, Culture, and Conflict in the Changing West*

Johnston, Verna: *California Forests and Woodlands*

Khosla, Maya: *Web of Water: Life in Redwood Creek*

Laws, John Muir: *The Laws Field Guide to the Sierra Nevada*

Noss, Reed, ed.: *The Redwood Forest: History, Ecology, and Conservation of the Coast Redwoods*

Schoenherr, Allan: *A Natural History of California*

Storer, Tracy et al.: *Sierra Nevada Natural History*

University of California, Davis: *Forest Stewardship Series*

University of California, Davis: *Summary of the Sierra Nevada Ecosystem Project*

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For Young Seedlings: Children's Books

Anderson, Margaret et al.: *Ancient Forests: Discovering Nature*
Baylor, Byrd: *The Table Where Rich People Sit*
Bishop, Nic: *Forest Explorer: A life-size Field Guide*
Bloomgren, Jennifer: *Where Would I Be in an Evergreen Tree?*
Cottrell, William: *The Book of Fire*
Dorros, Arthur: *Follow the Water from Brook to Ocean*
Franco, Carol: *A Child's Guide to California Wildflowers*
Fredericks, Anthony: *Under One Rock: Bugs, Slugs and other Ughs*
Gill, Shelly and Shannon Cartwright: *The Last American Rainforest*
Giono, Jean: *The Man Who Planted Trees*
Jeffers, Susan: *Brother Eagle, Sister Sky*
Khosla, Maya: *Web of Water: Life in Redwood Creek*
London, Jonathan: *Fire Race: A Karuk Coyote Tale*
Mania, Cathy and Robert Mania: *A Forest's Life: From Meadow to Mature Woodland*
McKinney, Barbara: *A Drop Around the World*
Olmstead, Adrienne: *My Nature Journal*
Rapp, Valerie: *Life in an Old Growth Forest*
Reed-Jones, Carol: *Salmon Stream*
Seuss, Dr. (Theodor Seuss Geisel): *The Lorax*
U.S. Department of Agriculture: *Woodsy Owl Invasive Weeds Activity Kit*
Ward, Jennifer: *Forest Bright, Forest Night*
Woodend, Rosetta: *Sammy Salmon's Big Adventure: The Life Cycle of a Salmon*

General Science Education Materials

The list below is not complete, but it includes most major science supply companies.
For more, perform an Internet search for "science supply houses."

Acorn Naturalists	www.acornnaturalists.com
Arbor Scientific	www.arborsci.com
Carolina Supply	www.carolina.com
Delta Education	www.delta-education.com
Edmund Scientific	www.scientificsonline.com
Fisher Scientific	www.fischersci.com
Flinn Scientific	www.flinnsci.com
NASCO	www.enasco.com
Sargent-Welch	www.sargentwelch.com
Science Kit and Boreal Laboratories	www.sciencekit.com
Wards Natural Science	www.wardsci.com

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Forestry Education Materials	
Calif. Foundation for Agriculture in the Classroom	www.cfaitc.org
Forest Foundation (also see “Freebies” below)	www.calforestfoundation.org
Forestry Suppliers	www.forestry-suppliers.com
Incense Cedar Institute	www.pencils.com
International Paper	www.internationalpaper.com
Project Learning Tree	www.plt.org
Society of American Foresters	www.safnet.org
Talk About Trees	www.talkabouttrees.org
Temperate Forest Foundation	www.forestinfo.org
Woodlinks	www.woodlinks.org

“Tree cookies” (sections of trees or branches showing growth rings and various growth patterns) can be purchased from several of the suppliers listed on page 347. Another source is Tom Catchpole. For price information and an order form, email Tom at treecookies@netptc.net. For large or custom orders, call (559) 855-2194.

Forestry equipment such as forester’s tapes for measuring diameter and increment borers for determining age and growth rates can be purchased from several companies. Perform an Internet search for “forestry supplies and equipment.”

Forestry and Wood Products Related Web Sites	
American Forest and Paper Association	www.afandpa.com
American Forests	www.americanforests.org
California Forestry Association	www.foresthealth.org
California Licensed Foresters Association	www.clfa.org
California Redwood Association	www.calredwood.org
California Department of Forestry and Fire Protection	www.fire.ca.gov
Forest Products Society	www.forestprod.org
The Agricultural Network	www.agnic.org
U.S.D.A. Forest Service	www.fs.fed.us
Western Wood Products Association	www.wwpa.org

The California Coastal Commission has a variety of resources that will be of interest to forest and watershed educators. Go to: www.coastforyou.org.

Consider obtaining copies of *Waves, Wetlands, and Watersheds* and *A Guide to the Side of the Sea*. Look at the *Marine, Coastal and Watershed Resources Directory*. Consider borrowing the following videos and DVDs: *After the Storm*, *Synthetic Sea*, *Empty Oceans*, *Empty Nets*, and *Can The Oceans Keep Up with the Hunt?*

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Freebies

The Forest Foundation has variety of materials available, including video tapes, curriculum packets, and posters with titles such as *Forest Management Practices*, *Forests are Important to All of Us*, *The Most Common Trees in California Forests*, and *The Forest Cycle*. They also have a booklet titled *A Guide to California's Wildlife on Private Forestlands*.

(www.calforestfoundation.org or (866) 241-TREE)

Better than free! The Forestry Institute for Teachers (F.I.T.) will pay teachers a stipend for participating in the week-long institute and completing a curriculum development project. These institutes are offered during the summer at several sites around the state, including Humboldt State University.

(www.forestryinstitute.org or (800) 738-TREE)

Project Learning Tree publishes a *Pre K–8 Environmental Education Guide* that includes nearly 100 activities as well as very useful appendices. To obtain the guide, one must participate in a very enjoyable teacher training workshop. The California P.L.T. coordinator can be reached at:

(kay.antunez@fire.ca.gov or (916) 653-7958)

The United States Environmental Protection Agency has produced *Climate Change, Wildlife, and Wildlands: A Toolkit for Teachers and Interpreters*. This free kit includes a CD, video tape, a wheel for determining CO₂ production and ways to reduce it, and cards depicting ways that wildlife are affected by global warming, and other classroom resources.

www.epa.gov/globalwarming or (202) 564-3482 or (304) 535-6057

The United States Forest Service has a series of posters including such topics as: fire's role in nature, leaves, birds, fungi, animal babies, birds nests and eggs, insects, state trees, reptiles, butterflies, edible forest plants, animal tracks, fish, and others. They are distributed in conjunction with the National Association of State Foresters. Contact your nearest U.S.D.A. Forest Service or California Department of Forestry and Fire Protection Office.

Appendix V RESOURCES CITED OR USED IN *THE CONIFER CONNECTION*

Introduction

Lieberman, Gerald and Linda Hoody. *Closing the Achievement Gap: Using the Environment as an Integrating Context for Learning*. Poway, CA: Science Wizards, 2002. (This booklet reports the results of a nationwide study on using environment-based education to improve learning.)

Louv, Richard. *Last Child in the Woods: Saving Our Children from Nature-Deficit Disorder*. Chapel Hill, NC: Algonquin Books of Chapel Hill, 2005. (Eloquent discussion of the importance of experiencing nature. Very important reading for teachers and parents.)

Resources Used for Section I:

NATURAL HISTORY OF THE CONIFEROUS FOREST

Aesop's Fables: Illustrated Junior Library. New York, NY: Grosset and Dunlap, Inc., 1947. (This collection of Aesop's fables tells the stories in simple language accompanied by simple illustrations. Other, more recent, volumes may include other fables, more interesting illustrations, and the stories may have different titles.)

Alden, Peter and Fred Heath. *National Audubon Society Field Guide to California*. New York, N.Y.: Alfred A. Knopf, Inc, 1998. (Comprehensive guide to California's natural history. Includes section on parks and preserves. Many photographs.)

Allaby, Michael. *Temperate Forests*. New York, NY: Facts on File, Inc., 1999. (Very informative book that includes lots of clearly explained scientific information.)

Arno, Stephen. *Discovering Sierra Trees*. Yosemite, CA: Yosemite Natural History Association, 1973. (Both natural and human history information about 36 of the more common trees in the Sierra Nevada Mountains.)

Behler, John and F. Wayne King. *The Audubon Society Field Guide to North American Reptiles and Amphibians*. New York, NY: Alfred A Knopf, 1979. (Part of the excellent Audubon Field Guide series, which include not only descriptions and maps, but information on tracks and scat and quite a bit of other information.)

Berger, John. *Understanding Forests*. San Francisco, CA: The Sierra Club, 1998. (An overview of forests and forestry, written from a Sierra Club perspective.)

Borror, Donald J. *Dictionary of Word Roots and Combining Forms*. Mountain View, CA.: Mayfield Publishing Company, 1988. (An excellent resource for learning about word roots. I recommend it for all teachers and naturalists.)

Borror, Donald and Dwight DeLong. *An Introduction to the Study of Insects*. New York, NY: Holt, Rinehart and Winston, 1964. (Standard key to identifying insects, includes a lot of information about them.)

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Borror, Donald J and Richard E. White. *A Field Guide to Insects: America North of Mexico*. New York, NY: Houghton Mifflin, 1970. (Part of the excellent Peterson Field Guide series.)

Bossard, Carla *et al.* *Invasive Plants of California's Wildlands*. Berkeley, CA: University of California Press, 2000. (Information on the biology and control of 78 non-native plants. Unfortunately, no index or key for identification, and you need to know the scientific name of the plant.)

Brown, Vinson and Barbara Black. *The Sierra Nevada Wildlife Region*. Happy Camp, CA: Naturegraph, 1996. (Basic guide to Sierra Nevada wildlife and ecology.)

Bureau of Land Management *et al.* *Invasive Weeds: A Growing Pain*. Washington, D.C.: Department of the Interior, Bureau of Land Management, date unknown. (Poster with pictures of several invasive species on the front and activities on the back.)

Burt, William and Richard Grossenheider. *A Field Guide to the Mammals: North America North of Mexico*. New York, NY: Houghton Mifflin, 1980. (Part of the excellent Peterson Field Guide series.)

Butts, Marilyn and Stephanie Prescott (ed.). *Science Framework for California Public Schools*. Sacramento, CA: California Department of Education, 1990.

Lizards that Fight Lyme Disease. Undated. California Academy of Sciences. 14 December, 2010. www.calacademy.org/science_now/archive/wild_lives/fence_lizards.

California State Parks. *Silent Threats: Non-Native Species Invading our Wildlands*. Sacramento, CA: California State Parks, 2007. (Brochure that describes problems of invasive species.)

Cole, Mason and Mariette Cole. *Lichens of California*. Berkeley, CA: University of California Press, 1988. (In addition to a key for identifying lichens, this book includes some information on economic uses, collecting lichens, and history.)

Cottrell, William. *The Book of Fire*. Missoula, MT: Mountain Press Publishing Company, 2004. (Interesting book with lots of information about the science of fire. Suitable for ages 12 up.)

Deem, Adam. *A Guide to California's Wildlife on Private Forestlands*. Auburn, CA: The California Forest Foundation, 2006. (This publication, as well as other resources, is available free to teachers. It includes photographs and other information about many different animals, broken down by types of forests...a very useful resource!)

Diller, Lowell. "Wildlife of the Redwood Region," in *Proceedings of the Conference on Coast Redwood Forest Ecology and Management*. Arcata, CA: Humboldt State University, 1996. (This document includes almost 60 articles and presentations on coast redwood ecology and management.)

Dobbins, Rebecca, *et al.* *The Changing Forest: Forest Ecology*. Washington, D.C.: Project Learning Tree/American Forest Foundation, 1996. (This secondary PLT module includes a variety of activities dealing with factors that change forests, including fire.)

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Doppelt, Bob *et al.* *Entering the Watershed: A New Approach to Save America's River Ecosystems*. Washington, D.C.: Island Press, 1993. (An extensive resource for those who might want to undertake efforts to study and protect streams and watersheds.)

Dorros, Arthur. *Follow the Water from Brook to Ocean*. New York, NY: Harper Collins Childrens Books, 1991. (As the title implies, this book follows the path of water from headwaters to the sea.)

Eder, Tamara. *Mammals of California*. Auburn, WA: Lone Pine Publishing, 2005. (Excellent resource includes one page descriptions of each species, a section on introduced species, fine illustrations.)

Epstein, Paul and Gary Tabor. *Climate Change Is Really Bugging our Forests*. Washington, D.C.: The Washington Post, September 7, 2003. (This article is a brief summary of the effects of global warming on forests, especially on insect populations.)

Ferrar, H. *et al.* *The Concise Oxford French Dictionary*. New York, N.Y.: Oxford University Press, 1980.

Fix, David and Andy Bezener. *Birds of Northern California*. Auburn, WA: Lone Pine Publishing, 2000. (Nicely illustrated guide.)

Fritz, Emanuel. *Story Told by a Fallen Redwood*. San Francisco, CA: Save-the-Redwoods League, 1995. (Very interesting booklet describing the information that can be gleaned from studying tree rings and other characteristics of a fallen redwood in Richardson Grove State Park in Humboldt County. Nicely illustrated, good companion to some of the activities in *Redwood Ed* and *The Conifer Connection*.)

Goodson, Gar. *Fishes of the Pacific Coast*. Stanford, CA: Stanford University Press, 1988. (A nice handbook of fish of the Pacific Coast.)

Gruell, George. *Fire in the Sierra Nevada Forests: A Photographic Interpretation of Ecological Change since 1849*. Missoula, MT: Mountain Press Publishing Company, 2001. (Side-by-side photographs of many places in the Sierra, comparing the sites in the 1800s and early 1900s to the same sites in the 1990s. Includes background information on natural and human history as well as a section on agents of change.)

Guralnik, David B. (ed). *Webster's New World Dictionary of the American Language, Second College Edition*. New York, N.Y.: Simon and Schuster, 1984.

Hauser, Susan Carol. *Outwitting Ticks: The Prevention and Treatment of Lyme Disease and Ailments Caused by Ticks, Scorpions, Spiders, and Mites*. New York, NY: The Lyons Press, 2001. (Very informative book about ticks (and tick-borne diseases) and other relatives such as the black widow spider, brown recluse spiders, scorpions, and others.)

Hill, Mary. *Geology of the Sierra Nevada*. Berkeley, CA: University of California Press, 2006. (Includes information on general geology as well as geology specific to the Sierra Nevada.)

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Hubard, Douglass. *Yosemite Pocket Guide*. Fredricksburg, TX: Awani Press, 2004. (A brief yet thorough guide to natural and human history of Yosemite and the Sierra.)

Ingles, Lloyd. *Mammals of the Pacific States*. Stanford, CA.: Stanford University Press, 1965. (Includes a key for identifying mammals and pictures and information about most species.)

Integrated Taxonomic Information System www.itis.usda.gov. This is a Web site where one can check common and scientific names to find out the currently accepted names of organisms.)

Izaak Walton League. *A Volunteer Monitor's Field Guide to Aquatic Macroinvertebrates*. Gaithersburg, MD: Izaak Walton League, undated. (This laminated guide will be helpful when studying aquatic organisms and stream systems. www.iwla.org)

Little, Charles. *The Dying of the Trees: The Pandemic in America's Forests*. New York, NY: the Penguin Group, Viking Press, 1995. (Chapters on various problems in forests, ranging from fire suppression to beetle attacks to diseases and smog.)

London, Jonathan. *Fire Race: A Karuk Coyote Tale*. San Francisco, CA: Chronicle Books, 1993. (Nicely illustrated Native American tale about how fire came to people.)

lozzi, Louis *et al.* *Exploring Environmental Issues: Focus on Risk*. Washington, D.C.: Project Learning Tree/ American Forest Foundation, 1998. (This secondary PLT module includes a variety of activities to help students understand how one might evaluate risk.)

Johnston, Verna. *California Forests and Woodlands: A Natural History*. Berkeley, CA: University of California Press, 1994. (Each chapter focuses on organisms and ecology of a forest type such as Douglas-fir/Mixed-Evergreen, Midmountain Forests, North Coastal Forests, or Foothill Woodland. Both plants and animals are nicely illustrated.)

Johnston, Verna. *Sierra Nevada: The Naturalist's Companion*. Berkeley, CA: University of California Press, 1998. (Each chapter focuses on a particular aspect of Sierran ecology such as a region, fire ecology, or species such as the giant Sequoia.)

Khosla, Maya. *Web of Water: Life in Redwood Creek*. San Francisco, CA: Golden Gate National Parks Association, 1997. (This beautifully illustrated book describes life in Muir Woods' Redwood Creek. Many different plants and animals found in creeks throughout the redwood region are illustrated, and the scientific information is mixed with beautifully written prose.)

Kricher, John. *A Field Guide to California and Pacific Northwest Forests*. New York, N.Y.: Houghton Mifflin, 1998. (Part of the excellent Peterson Field guide series. Includes many illustrations and includes both plants and animals.)

Lake Tahoe Basin Weed Coordinating Group. *Don't Plant a Pest!* South Lake Tahoe, CA: Lake Tahoe Basin Weed Coordinating Group, 2004. (Brochure that suggests alternatives to commonly planted invasive species.)

Lanner, Ronald. *Conifers of California*. Los Olivos, CA: Cachuma Press, 1999. (Beautifully illustrated with drawings and photographs. Lots of information on most of California's coniferous trees.)

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- Laws, John Muir. *The Laws Field Guide to the Sierra Nevada*. Berkeley, CA: Heyday Books, 2007. (Beautifully illustrated, easy to use, up-to-date resource. (Many interesting descriptions of behavior and other information.)
- Little, Elbert. *The Audubon Society Field Guide to North American Trees*. New York, N.Y.: Alfred A. Knopf, 1980. (Many photos of leaves and fruits...excellent guide.)
- McEvoy, Thom. *Positive Impact Forestry: A Sustainable Approach to Managing Woodlands*. Washington, D.C.: Island Press, 2004. (Describes ways to practice sustainable forestry.)
- Merriam, C. Hart. *Indian Names for Plants and Animals Among Californian and Other Western North American Tribes*. Socorro, N.M.: Ballena Press, 1979. (This book provides the names of many plants and animals in several different Native American languages.)
- Metcalf, Woodbridge. *Native Trees of the San Francisco Bay Region*. Berkeley, CA: University of California Press, 1966. (Part of the California Natural History Guide series.)
- Mitchell, Mark and William Stapp. *Field Manual for Water Quality Monitoring*. Dubuque, IA: Kendall/Hunt Publishing Company, 1997. (Provides extensive background on water quality and monitoring for many factors.)
- Munz, Philip and David Keck. *A California Flora*. Berkeley, CA: University of California Press, 1965. (This is a commonly used "key" for California plants.)
- Murdoch, Tom et al. *Streamkeeper's Field Guide*. Everett, WA: The Adopt-A-Stream Foundation, 2001. (Excellent resource for anybody who wants to undertake an extensive stream study. Includes many cartoons.)
- National Geographic Society. *Field Guide to the Birds of North America*. Washington, D.C.: National Geographic Society, 1999. (Nicely illustrated, includes a section on bird anatomy.)
- Nevada Placer Weed Management Area. *Noxious Weeds of the Sierras*. Grass Valley, CA: Nevada County Resource Conservation District, undated. (Color brochure about several invasive weed species and their control.)
- North, Malcom et al. *An Ecosystem Management Strategy for Sierran Mixed-Conifer Forests*. Vallejo, CA: USDA Forest Service Pacific Southwest Research Station, 2009. (General Technical Report number PSW-GTR-220. It includes a discussion of the complexity of managing forests for fire and other uses.)
- Noss, Reed (ed.). *The Redwood Forest: History, Ecology, and Conservation of the Coast Redwoods*. San Francisco, CA: Save-the-Redwoods League, 2000. (Excellent resource: Provides lots of background information. Some very readable; some may be too detailed or scientific for the average reader. Excellent companion to *Coast Redwood* by Barbour.)
- Ong, Faye and Janet Lundin (ed.). *Science Framework for California Public Schools*. Sacramento, CA: California Department of Education, 2004.

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Ornduff, Robert *et al.* *Introduction to California Plant Life*. Berkeley, CA: University of California Press, 2003. (Many photographs, but also lots information in text. Not just a field guide.)

The Oxford-Duden Pictorial German and English Dictionary. New York, N.Y.: Oxford University Press, 1979.

The Oxford-Duden Pictorial Spanish and English Dictionary. New York, N.Y.: Oxford University Press, 1995.

Paruk, Jim. *Sierra Nevada Tree Identifier*. Yosemite National Park, Yosemite, CA: Yosemite National Park Association, 1997. (An easy-to-use key for identifying trees of the Sierra and beyond.)

Pavlick, Bruce *et al.* *Oaks of California*. Los Olivos, CA: Cachuma Press, 1991. (Beautifully illustrated book with everything you want to know about California's oaks.)

Peluso, Beth. *The Charcoal Forest: How Fire Helps Animals and Plants*. Missoula, MT: Mountain Press Publishing Company, 2007. (Information on fire ecology. Ages 8 and up.)

Perry, Lisa. Talk given at the Pacific Forest Institute, June, 2007 at William Jessup University in Rocklin, CA. (Lisa is/was the Education Director for the California Forest Products Commission, in Auburn, CA.)

Peterson, Roger Tory. *A Field Guide to Western Birds*. Boston, MA: Houghton Mifflin, 1990. (Part of the excellent Peterson Field Guide series.)

Petrides, George and Oliva Petrides. *Western Trees*. New York, NY: Houghton Mifflin, 1992. (Part of the excellent Peterson Field Guide series. Includes origin of scientific names (word roots) for many species.)

Petti, Vincent and Kersten Petti. *Hippocrene Standard Dictionary: English-Swedish/Swedish-English*. New York, N.Y.: Hippocrene books, 1993.

Pough, Richard. *Audubon Western Bird Guide: Land, Water, and Game Birds*. Garden City, NY: Doubleday and Company, 1957.

Purvis, William. *Lichens*. Washington, D.C.: Smithsonian Institution Press, 2000. (Excellent resource on lichens. Includes many color photographs and information on a variety of lichen-related topics.)

Rapp, Valerie. *Science Update: New Findings About Old-Growth Forests*. Portland, OR: USDA Forest Service Pacific Northwest Research Station, 2003. (Summary of the difficulty in defining "old growth" forests.)

Rapp, Valerie. *Science Update: Invasive Plants in 21st Century Landscapes*. Portland, OR: USDA Forest Service Pacific Northwest Research Station, 2005. (Discussion of invasive plants, the problems that they cause, and dealing with the problems.)

Robbins, Chandler *et al.* *A Guide to Field Identification: Birds of North America*. New York, NY: Golden Press, 1966. (A standard field guide to birds.)

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Rosenthal, Ann. *Science Perspectives: High Sierra Ecosystems*. Albany, CA: USDA Forest Service Pacific Southwest Research Station, 2003. (Brochure discussing the role of fish stocking in the decline of amphibians in high Sierra lakes.)

Schoenherr, Allan. *A Natural History of California*. Berkeley, CA: University of California Press, 1992. (This classic natural history guide is nicely updated and illustrated.)

Smith, Jane and Nancy McMurray. *FireWorks Curriculum*. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, 2000. (General Technical Report RMRS-GTR-65. This is an educational program for students in grades 1–10.)

Smith, Robert. *Ecology and Field Biology*. New York, NY: Harper and Row, 1966. (A very good general ecology text.)

Stebbins, Robert. *A Field Guide to Western Reptiles and Amphibians*. New York, NY: Houghton Mifflin, 2003. (Part of the excellent Peterson Field Guide series.)

Storer, Tracy *et al.* *Sierra Nevada Natural History*. Berkeley, CA: University of California Press, 2004. (Easy to read and understand, this is an excellent resource.)

Stuart, John and John Sawyer. *Trees and Shrubs of California*. Berkeley, CA: University of California Press, 2001. (Includes keys to genera of conifers and broadleaved trees and shrubs, and descriptions of California's trees and shrubs.)

Torgersen, Torolf and Anna Torgersen. *Save our Birds: Save our Forests*. USDA Forest Service, Pacific Northwest Research Station, 1995. (Brochure with lots of information on the importance of birds in controlling forest insect pests.)

United States Department of Agriculture. *Woodsy Owl Invasive Weeds Activity Kit*. Washington, D.C.: U.S. Department of Agriculture, U.S. Forest Service, 2003. (Packet of activities and information for younger children.)

University of California, Davis. *Forest Stewardship Series*. Davis, CA: University of California, Davis, Division of Agriculture and Natural Resources, 2007. (An extensive series of short papers on a wide variety of forest land management topics. Publication number 8231 is available for downloading at: <http://anrcatalog.ucdavis.edu>.)

University of California, Davis. *Summary of the Sierra Nevada Ecosystem Project Report*. Davis, CA: University of California, Davis, Centers for Water and Wildland Resources, 1996. (Wildland Resources Center Report No. 39. Very interesting summary of a study done on various aspects of the Sierra Nevada ecosystem and how people interact with it.)

Uvdardy, Miklos (revised by John Farrand). *The Audubon Society Field Guide to North American Birds*. New York, NY: Alfred A Knopf, 1994. (Part of the excellent Audubon Field Guide series, which include not only descriptions and maps, but information on tracks and scat and quite a bit of other information.)

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Walker, Laurence C. *Forests: A Naturalist's Guide to Trees & Forest Ecology*. New York, NY: John Wiley & Sons, 1990. (Chapter 1 provides basic forest ecology, then chapters on various types of trees—coast redwood, Douglas-fir, cottonwood, etc., with each chapter giving historical, scientific, and other information, including “Projects for the Amateur Naturalist.”)

Watts, Tom. *Pacific Coast Tree Finder: A Pocket Manual for Identifying Pacific Coast Trees*. Rochester, N.Y.: Nature Study Guild, 1973. (Very handy and easy to use “key” to most of the common trees. Part of a series that includes both plants and animals.)

Whitaker, John. *The Audubon Society Field Guide to North American Mammals*. New York, NY: Alfred A Knopf, 1996. (Part of the excellent Audubon Field Guide series, which include not only descriptions and maps, but information on tracks and scat and quite a bit of other information.)

Yocom, Charles and Ray Dasmann. *The Pacific Coastal Wildlife Region: Its Common Wild Animals and Plants*. Happy Camp, CA.: Naturegraph Publishing Company, 1965. (Naturegraph publishes several good guides on nature and Native Americans, among other topics.)

Yosemite Association. *Trees of the Sierra Nevada*. Yosemite National Park, CA: Yosemite Association, 1995. (The Yosemite Association has produced a series of laminated cards with common organisms clearly drawn and described. Topics include trees, flowers, birds, and mammals. Contact: www.yosemite.org (916) 379-2648.)

Resources Used for Section II: HUMAN HISTORY OF CALIFORNIA'S CONIFEROUS FORESTS

Adams, Kramer. *The Redwoods*. New York, NY: Popular Library, undated—circa 1969. (This small volume contains lots of information presented in an easy to read style. Out of print, but can be found on Internet sites.)

Arvola, T.F. *Regulation of Logging in California: 1945–1975*. Sacramento, CA: California Division of Forestry, 1976. (An interesting chronology of people and events that affected timber legislation from 1945–1975.)

Barbour, Michael *et al.* *Coast Redwood: A Natural and Cultural History*. Los Olivos, CA: Cachuma Press, 2001. (Excellent, well written, well illustrated comprehensive source. A must-have for people who want to understand the coast redwoods.)

Christensen, Glenn *et al.* *California's Forest Resources, 2001–2005: Five-Year Forest Inventory and Analysis Report*. Portland, OR: U.S.D.A. Pacific Northwest Research Station, 2008. (Publication # PNW-GTR-763 includes statistics and information on many aspects of California's forest resources. (503) 808-2138 pnw_pnwpubs@fs.fed.us)

Conway, Steve. *Logging Practices: Principles of Timber Harvesting Systems, Revised Edition*. San Francisco, CA: Miller Freeman Publications, Inc., 1982. (A somewhat detailed description of logging practices in 1982.)

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Dekker-Robertson, Donna. "Global Thinking Needed," *California Forests*, Vol. 8, No. 1, Spring, 2004. Sacramento, CA: California Forestry Association. (Interesting articles in a forest products industry publication.)

Dicus, Christopher and Kenneth Delfino. *A Comparison of California Forest Practice Rules and Two Forest Certification Systems*. San Luis Obispo, CA: California Polytechnic State University, 2003. (Compares the California forest practice rules and third-party certification by the Forest Stewardship Council and the Sustainable Forest Initiative. Funded by the California Forest Products Commission.)

Duane, Timothy. *Shaping the Sierra: Nature, Culture, and Conflict in the Changing West*. Berkeley, CA: University of California Press, 1998. (After a brief review of history, the author discusses how land use decisions are made and how they affect the environment.)

Eargle, Dolan. *The Earth is Our Mother: A Guide to the Indians of California, Their Locales and Historic Sites*. San Francisco, CA: Trees Company Press, 1986. (Part One provides historical background information. Part II describes various groups, including discussion of present-day reservations and Rancherias. Part III is about problems of California Indians in today's society.)

Emanuel, George. *California Indians: An Illustrated Guide*. Lemoore, CA: Kings River Press, 1993. (Information about and pictures of 17 major California Indian groups.)

Farquhar, Francis. *History of the Sierra Nevada*. Berkeley, CA: University of California Press, 1965. (Well documented, easy to read history.)

Giono, Jean. *The Man Who Planted Trees*. Chelsea, VT: Chelsea Green Publishing Company, 1985. (An interesting and inspiring fiction book about a man who made it his life's work to plant trees to restore forests in Europe.)

Hackett, Steven. "The North Coast Region of California: Economic and Demographic Trends and Outlook." Panel presentation for the California Employment Development Department. Sacramento, CA: May, 2006. (Professor Hackett provided me with a copy of his Power Point slide presentation. He is a professor at Humboldt State University.)

Hartman, Bob *et al.* *California's Plumas Eureka State Park Gold*. Blairsden, CA: Plumas Eureka State Park Association, 2004. (Historical information about Plumas Eureka State Park.)

Hewes, Jeremy. *Redwoods: The World's Largest Trees*. San Francisco, CA: Rand McNally and Company, 1981. (An excellent resource. Clearly written, richly illustrated with both black and white and color photographs. Includes science and history of both coast redwood and the giant Sequoia redwoods in the Sierra.)

Hyde, Philip and Francois Leydet. *The Last Redwoods*. San Francisco, CA: The Sierra Club, 1963. (This large format book was published as a call to arms for the creation of a Redwood National Park. Many beautiful pictures along with pictures of logging in the redwoods.)

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Johnstone, Peter (ed.). *Giants in the Earth: The California Redwoods*. Berkeley, CA: Heyday Books, 2001. (An excellent collection of primary source essays, poems, articles, and photographs. Not to be confused with *Giants in the Earth: A saga of the Prairie*, by Ole Rolvaag.)

Leavell, Chuck. *Forever Green: The History and Hope of the American Forest*. Dry Branch, GA: Evergreen Arts, 2001. (An easy-to-read history of our use of forests.)

Lescohier, Roger. *Lester Pelton and the Pelton Water Wheel*. Grass Valley, CA: Empire Mine Park Association, 1992. (Booklet describing mining machinery at the Empire Mine.)

Lindquist, J.L. and M.N. Palley. *Empirical Yield Tables for Young-Growth Redwood: California Agricultural Experiment Station Bulletin # 796*. Berkeley, CA: 1963.

McEvoy, Thom. *Positive Impact Forestry: A Sustainable Approach to Managing Woodlands*. Washington, D.C.: Island Press, 2004. (Describes ways to practice sustainable forestry.)

McWilliams, Bruce (researcher). *The Forest Products Industries in California: Their Impact on the State Economy*. Oakland, CA: Regents of the University of California, 1994. (Lots of data, most presented in graphs and tables. Publication # CNR002.)

Miller, Char and Rebecca Staebler. *The Greatest Good: 100 years of Forestry in America*. Bethesda, MD: The Society of American Foresters, 1999. (Photographic history of forestry in America.)

Noss, Reed (ed.). *The Redwood Forest: History, Ecology, and Conservation of the Coast Redwoods*. San Francisco, CA: Save-the-Redwoods League, 2000. (Excellent resource. Provides lots of background information. Some very readable, some may be too detailed/scientific for the average reader. Excellent companion to Barbour's *Coast Redwood*.)

Raphael, Ray. *More Tree Talk: The People, Politics, and Economics of Timber*. Washington, D.C.: Island Press, 1994. (This book consists of a series of interviews with people with a range of perspectives on the timber industry. It is not just opinions; it includes a lot of factual information that can help one understand forests and the forest products industry.)

Russell, Will. "The Influence of Industrial Forest Management Interests on Forest Restoration and Carbon Sequestration Policy and Practice." *The International Journal of Environmental, Cultural, Economic, and Social Sustainability*, Volume 6, Number 5, 2010. (This article discusses the claim that young forests sequester carbon at a greater rate than old growth forests.)

Schubert, John C. *Guerneville Early Days: A History of the Lower Russian River*. Guerneville, CA: John C. Schubert, publisher, 2005. (Lots of interesting photos and other illustrations accompanying first-hand accounts of life in the Russian River area.)

Seuss, Dr. (Theodor Seuss Geisel). *The Lorax*. New York, NY: Random House, 1971. (An Internet search will provide a variety of Lorax-related information, including Earth Day activities, and a game called "The Lorax's Save the Trees Game.")

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Simberloff, Daniel. "Conservation," *The World Book Encyclopedia*, Vol. 4. Chicago, IL: World Book, Inc, 2002.

Thompson, Richard and Christopher Dicus. *The Impact of California's Changing Environmental Regulations on Timber Harvest Planning Costs*. San Luis Obispo, CA: California Polytechnic State University, 2005. (Funded by the Forest Foundation.)

Ward, Franklin. *California's Forest Products Industry: 1992*. Portland, OR: U.S. Department of Agriculture Pacific Northwest Research Station, 1992. (USDA Resource Bulletin # PNW-RB-206. Lots of tables with lots of data.)

Western Wood Products Association. *2002 Statistical Yearbook of the Western Lumber Industry*. Portland, OR: Western Wood Products Association, 2002. (Annual compilation of data. Unfortunately, the Association doesn't make its data available online, and won't lend past volumes, which they do sell. Each issue includes a summary of the findings and then data presented in tables.)

Western Wood Products Association. *2004 Statistical Yearbook of the Western Lumber Industry*. Portland, OR: Western Wood Products Association, 2002. (Annual compilation of data. Unfortunately, the Association doesn't make its data available online, and won't lend past volumes, which they do sell. Each issue includes a summary of the findings and then data presented in tables.)

Whitaker, J. Russell. "Conservation," *The World Book Encyclopedia*, Vol. 3. Chicago, IL: Field Enterprises Educational, 1962.

Wilson, James. *The Earth Shall Weep: A History of Native America*. New York, NY: Atlantic Monthly Press, 1998. (A history of the relations between Native Americans and others, from pre-Columbus to modern times.)

Woodhead, Henry (ed.). *The Indians of California*. Alexandria, VA: Time-Life Books, 1994. (Part of a series of books on Native Americans. Richly illustrated, includes information on recent struggles. Suitable for junior high school students.)

Resources Used for Section III:

FIELD TRIPS TO A CONIFEROUS FOREST AND WATERSHED

American Forest Foundation. *Project Learning Tree: Environmental Education Pre K-8 Activity Guide*. Washington, D.C.: American Forest Foundation, 2006. (Provides nearly 100 activities for field and classroom with extensive appendices and cross-referencing. Great resource!)

Carroll, Kathleen. *A Guide to Great Field Trips*. Chicago, IL: Zephyr Press, 2007. (Resource filled with many details about field trips, including philosophy behind field trips, logistics, and many suggestions for why and how to get students out of the classroom.)

THE CONIFER CONNECTION

Cornell, Joseph. *Sharing the Joy of Nature*. Nevada City, CA: Dawn Publications, 1989. (Sequel to *Sharing Nature with Children*. More activities and more philosophy.)

Council for Environmental Education. *Project WILD K–12 Activity Guide*. Houston, TX: Project Wild, 1992. (Similar to *Project Learning Tree*, this is a collection of over 110 activities for classroom and field, with many appendices and cross-references.)

Roa, Michael. *A Guide to the Side of the Sea*. Sacramento, CA: California State Parks Department, 2004. (Written to provide a resource for teachers who want to bring students to visit the rocky coast of northern California. Available for free online, on a CD, and in paper format. www.parks.ca.gov/teachersguides.)

Roa, Michael. *Redwood Ed*. Sacramento, CA: California State Parks Department, 2007. (Written to provide a resource for teachers who want to bring students to visit the coast redwood region. Available for free online, on a CD, and in paper format. www.parks.ca.gov/teachersguides.)

Resources Used for Section IV: LESSONS AND ACTIVITIES

Allen, Maureen, *et al.* *All About Water*. Sacramento, CA: California Department of Water Resources, undated. (Intended for grades K–3, but useful for other grade levels.)

American Forest Foundation. *Project Learning Tree: Environmental Education Pre K–8 Activity Guide*. Washington, D.C.: American Forest Foundation, 2006. (Provides nearly 100 activities for field and classroom with extensive appendices and cross-referencing. Great resource! www.plt.org)

Aston, Darcy *et al.* *Mountains to the Sea*. Santa Barbara, CA: City of Santa Barbara Creek Restoration and Water Quality Improvement Program, undated. (A watershed curriculum guide for grades 4–8.)

Baylor, Byrd. *The Table Where Rich People Sit*. New York, NY: Charles Scribner's Sons, 1994. (Children's book in which a child learns that even though her family doesn't have much money, they are rich in terms of their connections with nature.)

Brown-Babcock, Maria. *Save Our Seas*. San Francisco, CA: California Coastal Commission, 1993. (Published in conjunction with the Center for Marine Conservation. Excellent K–12 resource focusing on marine pollution.)

Bruton, Sheila and Faye Ong (ed.). *Science Content Standards for California Public Schools, Kindergarten Through Grade Twelve*. Sacramento, CA: California Department of Education, 2000.

Burt, William and Richard Grossenheider. *Peterson Field Guides: A Field Guide to the Mammals: North America north of Mexico*. New York, NY: Houghton Mifflin, 1980. (Part of an excellent series. Includes a few drawings of tracks.)

THE CONIFER CONNECTION

Butts, Marilyn and Stephanie Prescott (ed.). *Science Framework for California Public Schools, Kindergarten Through Grade Twelve*. Sacramento, CA: California Department of Education, 1990.

California Department of Forestry and Fire Protection. *Correlation of Project Learning Tree Environmental Education Pre K–8 Activity Guide to California English-Language Arts Content Standards*. Sacramento, CA: Project Learning Tree/CDF, 1999. For updated versions go to: www.plt.org/cms/pages/21_21_43.html.

California Department of Forestry and Fire Protection. *Correlation of Project Learning Tree Environmental Education Pre K–8 Activity Guide to California History/Social Science Content Standards*. Sacramento, CA: Project Learning Tree/CDF, 1999. For updated versions go to: www.pit.org/cms/pages/21_21_43.html.

California Department of Forestry and Fire Protection. *Correlation of Project Learning Tree Environmental Education Pre K–8 Activity Guide to California Science Content Standards*. Sacramento, CA: Project Learning Tree/CDF, 1999. For updated versions go to: www.plt.org/cms/pages/21_21_43.html.

California Department of Forestry and Fire Protection. *Correlation of Project Learning Tree Environmental Education Pre K–8 Activity Guide by Grade to California Content Standards for Language Arts, History/Social Science, and Science*. Sacramento, CA: Project Learning Tree/CDF, 1999. For updated versions, go to: www.plt.org/cms/pages/21_21_43.html.

Copeland, Willis (Project Director). *Creek Watchers: Exploring the Worlds of Creeks and Streams*. Santa Barbara, CA: California Aquatic Science Education Consortium, University of California Santa Barbara, undated. (A good collection of activities for creek studies.)

Cornell, Joseph. *Sharing Nature With Children*. Nevada City, CA: Dawn Publications, 1979. (Classic guide for nature activities...especially nature observation and appreciation.)

Cornell, Joseph. *Sharing the Joy of Nature*. Nevada City, CA: Dawn Publications, 1989. (Sequel to *Sharing Nature With Children*. More activities and more philosophy.)

Council for Environmental Education. *Project WILD*. Houston, TX: Council for Environmental Education, 2005. (Similar to *Project WILD-Aquatic* and *Project Learning Tree*, this is a collection of wildlife related activities. www.projectwild.org.)

Council for Environmental Education. *Project WILD-Aquatic*. Houston, TX: Council for Environmental Education, 2005. (Similar to *Project WILD* and *Project Learning Tree*, this is a collection of aquatic wildlife related activities.) www.projectwild.org.

Creating Coastal Stewardship Through Science. Point Reyes Station, CA: Point Reyes National Seashore, undated. (Good collection of activities, including field trip suggestions.)

Davenport, Julia. *Waves, Wetlands, and Watersheds*. San Francisco, CA: California Coastal Commission, 2007. (Activities to help students in grades 4–8 learn about water and watersheds.)

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Derby, Sandy and Amity Sandage. *Biosite: Students Investigating Their Environment*. San Jose, CA: Children's Discovery Museum of San Jose, 2004. (Valuable resource for teaching about field research, watersheds, and a variety of other topics.)

Elbroch, Mark. *Mammal Tracks & Sign: A Guide to North American Species*. Mechanicsburg, PA: Stackpole Books, 2003. (Includes more than 1000 color photographs of tracks and sign of North American mammals, including 104 life-size tracks and lots of other information.)

Farrand, John. *National Audubon Society Pocket Guide: Familiar Animal Tracks of North America*. New York, NY: Alfred Knopf, 1993. (This pocket-sized guide includes not only drawings of tracks, but information on habitat and range, other identifying characteristics and signs, and colored photographs.)

Firehook, Karen. *Hands-On Save Our Streams*. Gaithersburg, MD: Izaak Walton League of America, Inc., 1995. (Extensive manual for student stream investigations.)

Gidwitz, Tom. *Counting Rings: Tree-Ring Dating*. Tucson, AZ: Western National Parks Association, 2008. (Small illustrated booklet about how tree ring dating is used to determine dates in human history.)

Harrington, Jim and Monique Born. *Measuring the Health of California Streams and Rivers*. Sacramento, CA: Sustainable Land Stewardship International Institute, 2000. (Detailed guide for assessing the condition of streams.)

Haskin, Kathleen. *The Ways of Watersheds*. Claryville, NY: The Frost Valley YMCA, 1995. (While this guide is written for the New York City area, many of the activities that it contains are applicable or easily modified for use elsewhere.)

Hone, Elizabeth et al. *A Sourcebook for Elementary Science*. Sacramento, CA: California Department of Education, 1967. (This out-of-print book, along with the secondary *Sourcebook for Physical Science* and *Sourcebook for Biological Science*, are excellent resources with background information and hundreds of useful demonstrations and activities. School libraries, district resource centers, or experienced teachers may have copies.)

Izaak Walton League. *A Volunteer Monitor's Field Guide to Aquatic Macroinvertebrates*. Gaithersburg, MD: Izaak Walton League, undated. (This laminated guide will be helpful when studying aquatic organisms and stream systems. www.iwla.org.)

Jeffers, Susan. *Brother Eagle, Sister Sky*. New York, NY: Dial Books, 1991. (A nicely illustrated book about a famous speech by Chief Seattle.)

Kaufmann, Jeffrey, et al. *River Cutters*. Berkeley, CA: Lawrence Hall of Science, University of California, 1992. (Part of the excellent Great Explorations in Math and Science (GEMS) series.)

Keator, Glenn. *Pacific Coast Berry Finder*. Berkeley, CA: Nature Study Guild, 2003. (Part of a series of simple dichotomous keys. See also Keator (below), Lederer, Russo, and Watts.)

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Keator, Glenn. *Pacific Coast Fern Finder*. Berkeley, CA: Nature Study Guild, 2003. (Part of a series of simple dichotomous keys. See also Keator (above), Lederer, Russo, and Watts (below).)

Kids in Creeks: An Interdisciplinary Creek Exploration Program. Richmond, CA: The Watershed Project (formerly Aquatic Outreach Institute), 2000. (The Watershed Project offers teacher education workshops, community workshops, community projects, and restoration projects in the San Francisco Bay Area. *Kids in Creeks* is one of their educational projects.)

Klingensmith, Bob and Greg Geeting (ed.). *History-Social Science Content Standards for California Public Schools, Kindergarten Through Grade Twelve*. Sacramento, CA: California Department of Education, 2000.

Lederer, Roger. *Pacific Coast Bird Finder*. Berkeley, CA: Nature Study Guild, 2003. (Part of a series of simple dichotomous keys. See also Keator, Russo, and Watts.)

Lingelbach, Jenepher (ed.). *Hands-On Nature: Information and Activities for Exploring the Environment with Children*. Woodstock, VT: Vermont Institute of Natural Science, 1986. (Over 30 activities for teaching about nature.)

Litter Critters. Berkeley, CA: Outdoor Biology Instructional Strategies (OBIS), Lawrence Hall of Science, 1982. (OBIS is a collection of activities for teaching/learning about Biology.)

Lowery, James. *The Tracker's Field Guide*. Guilford, CT: Falcon Guide, 2006.

Mania, Cathy and Robert Mania: *A Forest's Life: From Meadow to Mature Woodland*. New York, NY: Franklin Watts/Grolier, 1997. (This children's book describes the changes as a forest develops on a burned site.)

McDougall, Len. *The Encyclopedia of Tracks and Scats: A Comprehensive Guide to the Trackable Animals of the United States and Canada*. Guilford, CT: The Lyons Press, 2004. (Includes photographs and line drawings, and information on interpreting animal behavior from tracks and scat.)

Miller, Bob et al. *Forest Ecosystem*. Hayfork, CA: *Adopt-A-Watershed Program*, 1999. (The *Adopt-A-Watershed* curriculum is a program with activities for students in grades K–High School.)

Miller, Kenneth and Joseph Levine. *Prentice Hall Biology*. Upper Saddle River, NJ: Pearson Education, 2002. (This is a popular high school biology text.)

Murdoch, Tom et al. *Streamkeeper's Field Guide*. Everett, WA: Adopt-A-Stream Foundation. (Extensive guide for someone who is serious about stream studies.)

National Academy of Sciences. *National Science Education Standards*. Washington, D.C.: National Academy of Sciences, 1996. (Beyond science content standards, this book includes science teaching standards and standards for professional development.)

National Council for the Social Studies. *Expectations of Excellence: Curriculum Standards for Social Studies*. Washington, D.C.: National Council for the Social Studies, 1994.

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Nelson, Dennis *et al.* *Discover a Watershed: Watershed Manager*. Bozemon, MT: Project WET: Discover a Watershed Series, The Watercourse, Montana State University, 2002. (Excellent collection of activities for teaching about watersheds.)

Olaus, Murie, Mark Elbroch, and Roger Tory Peterson. *Peterson Field Guides: Animal Tracks*. Boston, MA: Houghton Mifflin, 2005. (Part of the excellent Peterson Field Guide series that includes almost 50 titles.)

Olmstead, Adrienne. *My Nature Journal*. Lafayette, CA: Pajaro Publishers, 2000. (This is a very nice journal with space for writing and suggestions for writing topics and activities.)

Ong, Faye and Greg Geeting (ed.). *English-Language Arts Content Standards for California Public Schools, Kindergarten Through Grade Twelve*. Sacramento, CA: California Department of Education, 1998.

Ong, Faye and Janet Lundin (ed.). *Science Framework for California Public Schools: Kindergarten Through Grade Twelve*. Sacramento, CA: California Department of Education, 2004.

Outdoor Biology Instructional Strategies (OBIS). Berkeley, CA: Lawrence Hall of Science, 1982. (OBIS is a series of hands-on activities for studying biology.)

Schneider, Donald *et al.* *Expectations of Excellence: Curriculum Standards for Social Studies*. Washington, D.C.: National Council for the Social Studies, 1994. (Includes examples of how the standards might be taught.)

Project Learning Tree GreenWorks!: Connecting Community Action and Service Learning. Washington, D.C.: American Forest Foundation, 2001. Available at the PLT Web site. (Suggestions for getting students (or others) involved with service learning.) www.plt.org.

Project Learning Tree Secondary Environmental Education Program: Exploring Environmental Issues: Focus on Forests. Washington D.C.: American Forest Foundation, 1998. (Activities for studying issues forest use and management. Good appendices such as "Old Growth Articles and References" and "Forest Facts and Figures.") www.plt.org.

Roa, Michael. *Environmental Science Activities Kit*. San Francisco, CA: John Wiley & Sons, 1993. (This is a collection of activities that can be used to teach about a wide variety of environmental issues, including ways to work towards solutions. Some of the activities in *The Conifer Connection* are adapted from this book.)

Roa, Michael. *A Guide to the Side of the Sea*. Sacramento, CA: California State Parks Department, 2004. (Written to provide a resource for teachers who want to bring students to visit the rocky coast of northern California, including the redwood region. Available for free online, on a CD, and in paper format. www.parks.ca.gov/teachersguides.)

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Roa, Michael. *Redwood Ed*. Sacramento, CA: California State Parks Department, 2007. (Written to provide a resource for teachers who want to bring students to visit a coast redwood park. Available for free online, on a CD, and in paper format. www.parks.ca.gov/teachersguides.)

Russo, Ron. *Pacific Coast Mammals*. Berkeley, CA: Nature Study Guild, 2003. (Part of a series of simple dichotomous keys. See also Keator, Lederer, and Watts.)

Sheldon, Ian. *Animal Tracks of Northern California*. Auburn, WA: Lone Pine Press, 1998. (Includes descriptions and drawings of tracks, stride patterns, and other identifying features...small and lightweight.)

Shinkle, Jill. *Creek Watchers: Exploring the Worlds of Creeks & Streams*. Santa Barbara, CA: California Aquatic Science Education Consortium, University of California, Santa Barbara, undated. (Easy-to-use guide for creek studies.)

Silverstein, Shel. *The Giving Tree*. New York, NY: Harper & Row, 1964. (Classic children's book about a tree that keeps on giving.)

Sly, Carolie (Curriculum Coordinator). *Water Wisdom: A Curriculum for Grades Four Through Eight*. Hayward, CA: Alameda County Office of Education, 1990. (Good interdisciplinary collection of activities.)

Snively, Gloria. *Once Upon a Seashore: A Curriculum for Grades K–6*. Snooke, British Columbia: Kingfisher Press, 2001. (Good resource for teaching about the coast.)

Stall, Chris. *Animal Tracks of Northern California*. Seattle, WA: The Mountaineers, 1989. (Drawings of tracks of 122 mammals, reptiles, amphibians, birds, and invertebrates. Also includes natural history information on the organisms.)

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Yandala, Deb et al. *All The Rivers Run*. Peninsula, OH: Cuyahoga Valley Association, 1996. (A curriculum guide for grades 4–8, includes a CD.)

Other useful resources not specifically used in the development of activities in *The Conifer Connection*:

Ashley, Bob et al. *Rivers Curriculum Guide: Geography*. White Plains, NY: Dale Seymour Publications, 1997. (Good mix of background information and activities.)

Barrett, Katharine and Carolyn Willard. *Aquatic Habitats*. Berkeley, CA: Lawrence Hall of Science, University of California, Berkeley, 1998. (Part of the Great Explorations in Math and Science (GEMS) series, this book provides a series of activities to help students learn about aquatic habitats.)

Barrett, Katharine and Carolyn Willard. *Schoolyard Ecology*. Berkeley, CA: Lawrence Hall of Science, University of California, Berkeley, 1998. (Part of the Great Explorations in Math and Science (GEMS) series, this book provides a series of activities to help students learn about ecology through investigations that can be done at school.)

ILLUSTRATIONS

Cover

Michael Roa

Color photographs

California State Parks Photo Archives

Historic black and white image

Location of the background image: North Fork of the Stanislaus River near the USFS Wa Ku Luu Hep Yoo Campground

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Drawings

Unless otherwise noted, black and white drawings in *The Conifer Connection* were drawn by Faith Rumm, rummstudio@earthlink.net. Her drawings include the following: Figures 8, 13, 17–19, 45–48, 50–79, 84–120, 122–130, 132, 134–179, 184, 188, 189, 224–228, 231, 234–236, 240, 260–264. Ruth also drew the two caddis fly larvae and the rat-tailed fly larva in Figure 251.

Alexander O'Neill Roa drew the Connie Fir Teaching Idea and Caution icons.

Daniel J. Miller drew the coast redwood and giant Sequoia images, Figures 80–83

Figure 263 is from *Trees & Leaves CD-ROM & Book*, Dover Publications, Inc.

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Clarke Museum, Eureka, CA: Figures 195, 200, 204, 213

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Humboldt Redwood Company (formerly Pacific Lumber Company), Scotia, CA: Figures 196, 197, 201, 203, 205

Humboldt State University Library, Humboldt Room Collection, Arcata, CA: Figure 199

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Mariposa Museum and Historical Center Incorporated, Mariposa, CA: Figure 190

Mendocino Redwood Company, Ukiah, CA: Figures 209, 212

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The Sempervirens Fund, Los Altos, CA: Figure 208

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The U.S. Department of Agriculture U.S. Forest Service, Washington, D.C.:
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The U.S. Library of Congress, Washington, D.C.: Figures 186, 193, 194, 206

Yosemite National Park Research Library, Yosemite National Park, CA:
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